

PRELIMINARY DATA SUMMARY

August 1991

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Michael W. Leffler at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

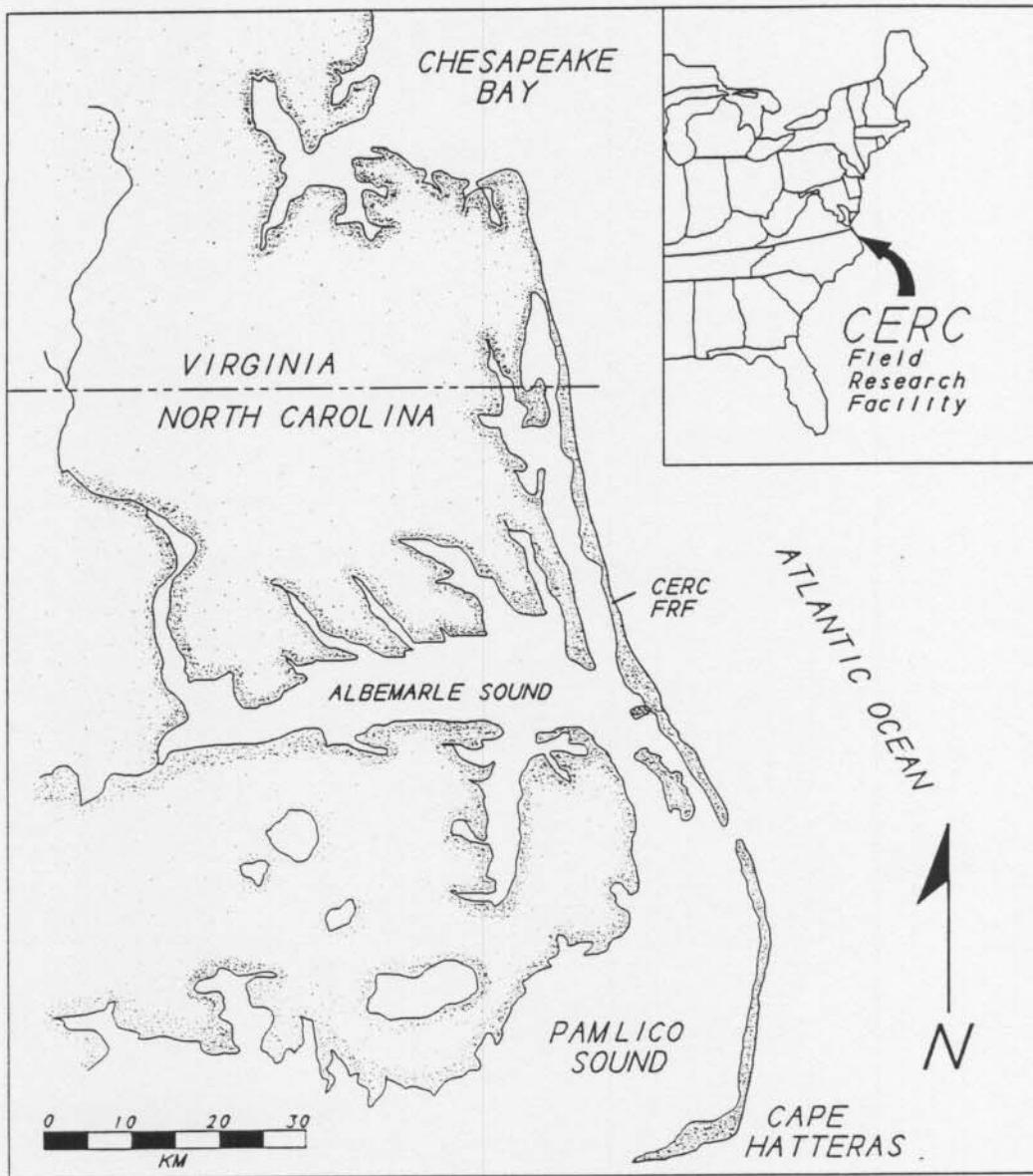


Figure 1. FRF Location Map

Table 1: Instrument Status/Data Availability

AUG 1991

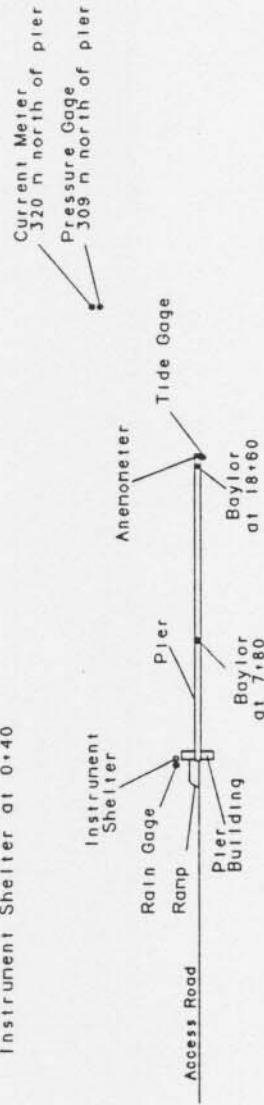
Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																		
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1				
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*		
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	/	*	*	*	*	
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

True North



Pier Building at 0.40 to 1.00
 Anenometer at 0.70
 12 Inch Rain Gage at 0.30
 Instrument Shelter at 0.40



5

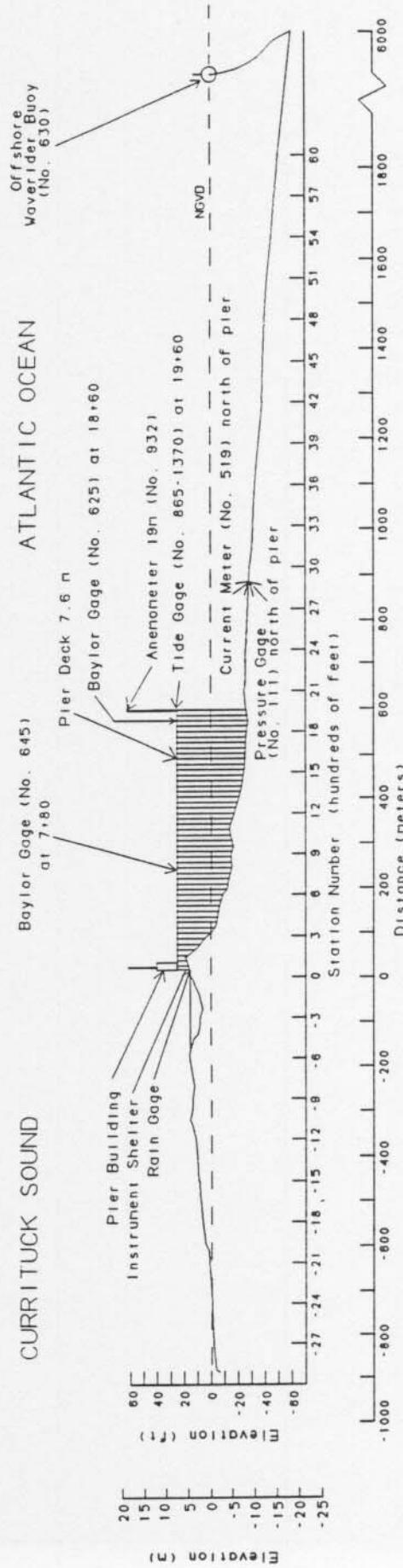


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Aug 1991

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	Pressure mb	mm
1	100	4	242	25.4	1014.5	0
	700	2	354	25.1	1015.2	0
	1300	2	216	26.2	1015.5	0
	1900	3	230	24.5	1014.8	0
2	100	5	246	25.4	1014.5	0
	700	3	286	25.5	1014.8	0
	1300	4	214	26.3	1014.8	0
	1900	6	205	26.3	1014.2	8
3	100	7	240	25.5	1013.1	0
	700	5	243	26.6	1012.1	10
	1300	4	215	29.7	1010.1	0
	1900	1	224	27.2	1009.8	0
4	100	3	240	27.3	1008.4	0
	700	5	274	27.3	1008.7	0
	1300	3	242	32.3	1009.1	0
	1900	3	247	30.1	1008.7	0
5	100	3	293	25.7	1010.1	5
	700	3	341	25.8	1012.8	0
	1300	5	26	27.6	1014.5	0
	1900	5	73	25.3	1015.2	0
6	100	3	74	25.3	1016.5	0
	700	5	57	26.0	1018.9	0
	1300	3	83	28.3	1019.9	0
	1900	3	79	25.8	1019.9	0
7	100	4	134	25.8	1020.3	0
	700	6	80	25.3	1020.6	0
	1300	6	156	24.5	1019.2	6
	1900	1	237	24.4	1017.9	0
8	100	3	318	23.5	1016.9	0
	700	2	350	24.3	1016.2	0
	1300	4	118	28.1	1015.5	0
	1900	6	130	25.5	1014.2	0
9	100	4	168	24.3	1013.1	0
	700	6	152	25.8	1012.5	0
	1300	10	180	30.5	1010.4	0
	1900	8	193	27.4	1007.7	0
10	100	6	227	25.9	1006.7	0
	700	3	263	26.0	1008.1	0
	1300	4	8	25.4	1009.8	0
	1900	3	45	25.0	1010.4	0
11	100	1	358	23.6	1012.1	0
	700	4	358	23.8	1014.5	0
	1300	5	11	27.6	1015.9	0
	1900	2	79	24.5	1015.9	0
12	100	1	151	21.8	1016.9	0
	700	0		24.7	1017.2	0
	1300	3	44	26.4	1016.9	0
	1900	5	20	24.3	1015.5	0
13	100	6	77	22.9	1015.2	0
	700	8	81	23.0	1014.5	5
	1300	6	21	24.4	1014.5	0
	1900	2	74	24.0	1013.8	0
14	100	1	209	23.1	1014.2	0
	700	2	223	24.7	1014.5	0
	1300	3	201	26.7	1013.8	0
	1900	3	188	25.2	1013.8	0
15	100	7	215	26.2	1013.1	0
	700	7	237	25.8	1014.2	0
	1300	4	210	26.4	1014.5	0
	1900	4	272	24.2	1014.5	0
16	100	4	282	23.0	1015.5	0
	700	2	278	23.4	1016.5	0
	1300	3	103	28.8	1016.9	0
	1900	5	158	25.1	1015.9	0

* electronic problems

(Continued)

Table 2: Meteorological Data

Aug 1991

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
17	100	2	228	23.8	1016.5	0
	700	0		24.4	1016.5	0
	1300	2	121	27.7	1015.5	0
	1900	0		26.1	1014.2	10
18	100	1	181	26.6	1012.5	0
	700	2	126	26.2	1012.8	0
	1300		Operator Error			0
	1900	13	68	25.5	1003.7	24
19	100	17	311	21.8	996.5	39
	700	8	261	24.8	1006.0	0
	1300	5	211	31.0	1007.4	0
	1900	8	180	27.0	1008.1	0
20	100	3	192	24.1	1008.7	0
	700	7	196	25.9	1008.7	0
	1300	9	193	26.0	1008.4	7
	1900	8	211	25.2	1009.1	0
21	100	5	237	23.5	1010.4	0
	700	3	284	23.0	1012.5	0
	1300	5	247	28.4	1013.5	0
	1900	1	290	25.6	1014.5	0
22	100	0		20.3	1014.8	0
	700	2	358	26.4	1016.2	0
	1300	3	74	27.7	1016.5	0
	1900	4	104	25.7	1016.2	0
23	100	2	78	25.5	1016.9	0
	700	3	105	25.8	1018.2	0
	1300	4	61	28.1	1018.9	0
	1900	3	171	26.4	1018.9	0
24	100	2	132	25.8	1020.3	0
	700	2	42	26.0	1021.3	0
	1300	2	61	27.6	1021.9	0
	1900	4	54	26.4	1021.6	0
25	100	6	40	25.9	1021.9	0
	700	10	48	25.8	1022.6	0
	1300	11	39	26.8	1022.3	0
	1900	13	35	25.6	1021.3	0
26	100	10	46	26.1	1020.3	0
	700	5	41	26.3	1020.6	0
	1300	10	50	26.8	1019.9	0
	1900	5	105	26.7	1019.6	0
27	100	6	83	26.4	1019.9	0
	700	5	100	27.0	1020.6	0
	1300	5	86	29.0	1020.3	0
	1900	5	97	26.9	1019.6	0
28	100	2	105	26.3	1019.9	0
	700	3	123	27.3	1020.6	0
	1300	4	109	30.5	1020.3	0
	1900	6	152	27.2	1018.6	0
29	100	4	218	26.7	1019.6	0
	700	4	279	27.5	1018.9	0
	1300	3	124	31.1	1018.2	0
	1900	5	153	27.9	1016.2	0
30	100	6	241	27.2	1015.9	0
	700	4	286	27.1	1015.2	0
	1300	4	244	32.0	1013.5	0
	1900	6	179	28.8	1011.8	0
31	100	7	243	27.5	1011.4	0
	700	6	234	26.6	1011.1	0
	1300	6	253	32.4	1010.4	0
	1900	4	206	30.0	1010.1	0
		<u>Resultant</u>		<u>Mean</u>	<u>Mean</u>	<u>Total</u>
		1	160	26.2	1014.8	114

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hr (more frequently during storms) beginning at 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for four contiguous 34-min records.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Aug 1991

Day	Hour	645		625		111		630	
		Baylor at 7+80 Hmo.m	T.sec	Baylor at 18+60 Hmo.m	T.sec	Pressure Gage Hmo.m	T.sec	Offshr Wvrdr Hmo.m	T.sec
1	0100	0.47	12.80	0.60	12.80	0.60	12.80	0.74	8.26
	0700	0.48	12.19	0.61	12.19	0.61	12.19	0.68	7.31
	1300	0.46	5.57	0.59	12.19	0.57	12.19	0.59	8.53
	1900	0.38	12.19	0.48	11.64	0.48	11.64	0.58	11.64
2	0100	0.34	11.64	0.40	12.19	0.41	12.19	0.50	6.40
	0700	0.33	12.19	0.40	12.19	0.40	12.19	0.50	11.64
	1300	0.27	11.64	0.34	12.19	0.35	11.64	0.44	11.64
	1900	0.28	11.64	0.35	11.13	0.35	11.13	0.48	11.13
3	0100	0.26	11.64	0.33	11.13	0.32	10.67	0.48	11.64
	0700	0.32	4.13	0.37	11.13	0.34	11.13	0.50	4.06
	1300	0.27	10.67	0.28	11.13	0.31	11.13	0.40	8.00
	1900	0.29	15.06	0.35	10.67	0.33	7.53	0.45	7.31
4	0100	0.26	8.00	0.32	15.06	0.32	8.00	0.40	6.74
	0700	0.26	15.06	0.32	15.06	0.31	15.06	0.39	15.06
	1300	0.26	14.22	0.32	15.06	0.30	14.22	0.41	15.06
	1900	0.27	15.06	0.36	15.06	0.31	14.22	0.40	14.22
5	0100	0.27	13.47	0.34	13.47	0.35	14.22	0.36	14.22
	0700	0.31	14.22	0.38	14.22	0.36	13.47	0.43	11.13
	1300	0.52	3.94	0.65	4.06	0.65	4.20	0.78	4.06
	1900	0.39	11.64	0.54	13.47	0.49	14.22	0.60	11.13
6	0100	0.40	10.67	0.52	10.67	0.46	13.47	0.57	10.67
	0700	0.43	14.22	0.55	13.47	0.46	13.47	0.56	10.24
	1300	0.41	12.80	0.55	12.80	0.49	12.80	0.53	12.80
	1900	0.34	14.22	0.49	13.47	0.44	13.47	0.50	13.47
7	0100	0.41	15.06	0.55	12.80	0.51	13.47	0.62	9.85
	0700	0.43	14.22	0.58	13.47	0.53	12.80	0.61	9.48
	1300	0.64	4.06	0.86	3.94	0.78	4.34	0.92	3.94
	1900	0.48	4.41	0.62	14.22	0.58	4.20	0.77	4.20
8	0100	0.45	14.22	0.63	14.22	0.56	8.83	0.65	9.14
	0700	0.42	9.48	0.63	9.14	0.58	9.48	0.66	9.14
	1300	0.42	12.19	0.57	8.83	0.51	9.48	0.58	13.47
	1900	0.53	9.14	0.69	9.85	0.61	9.48	0.70	9.48
9	0100	0.46	9.85	0.62	9.85	0.59	9.14	0.67	9.85
	0700	0.56	4.66	0.68	5.02	0.59	4.92	0.76	5.02
	1300	0.60	3.88	0.65	11.64	0.66	11.13	0.87	3.56
	1900	0.69	5.69	0.81	5.33	0.84	4.83	1.00	5.45
10	0100	0.56	5.22	0.66	5.12	0.63	5.45	0.74	5.45
	0700	0.44	11.13	0.55	10.67	0.54	10.67	0.63	11.13
	1300	0.44	9.85	0.54	10.67	0.48	10.67	0.58	10.67
	1900	0.40	11.13	0.49	11.64	0.46	10.67	0.53	10.67
11	0100	0.39	12.19	0.47	10.67	0.45	11.64	0.50	11.13
	0700	0.40	11.13	0.51	11.13	0.48	11.13	0.56	11.13
	1300	0.56	10.67	0.73	10.67	0.65	10.67	0.76	10.67
	1900	0.51	11.13	0.64	10.67	0.62	10.67	0.72	11.13
12	0100	0.45	10.24	0.70	10.24	0.63	10.24	0.69	10.24
	0700	0.46	10.67	0.71	9.85	0.67	10.24	0.78	9.48
	1300	0.44	10.24	0.74	10.24	0.66	8.83	0.73	10.24
	1900	0.40	9.14	0.61	9.14	0.61	8.83	0.64	9.85
13	0100	0.76	4.41	0.90	3.88	0.80	4.00	0.81	10.24
	0700	0.70	4.49	1.02	4.27	0.92	4.13	0.99	4.34
	1300	0.57	4.57	0.82	4.92	0.69	4.83	0.87	4.83
	1900	0.43	9.48	0.70	9.14	0.62	9.85	0.70	4.34
14	0100	0.35	10.24	0.54	10.24	0.47	9.48	0.59	9.48
	0700	0.27	9.85	0.43	9.85	0.38	9.48	0.43	9.14
	1300	0.24	9.85	0.36	9.85	0.34	10.24	0.41	9.85
	1900	0.27	9.48	0.38	9.85	0.35	9.85	0.48	9.85
15	0100	0.29	4.20	0.38	9.85	0.33	9.85	0.54	9.14
	0700	0.24	9.48	0.30	9.14	0.29	9.48	0.40	9.48
	1300	0.23	9.48	0.30	9.85	0.28	9.48	0.34	9.48
	1900	0.27	9.48	0.34	9.48	0.29	9.14	0.37	8.83
16	0100	0.20	14.22	0.27	9.14	0.28	9.14	0.33	9.48
	0700	0.22	9.48	0.29	9.14	0.28	9.14	0.32	8.83
	1300	0.26	9.14	0.32	9.14	0.30	8.53	0.36	8.53
	1900	0.27	15.06	0.34	9.14	0.33	13.47	0.34	8.53

* Electronic problems

(Continued)

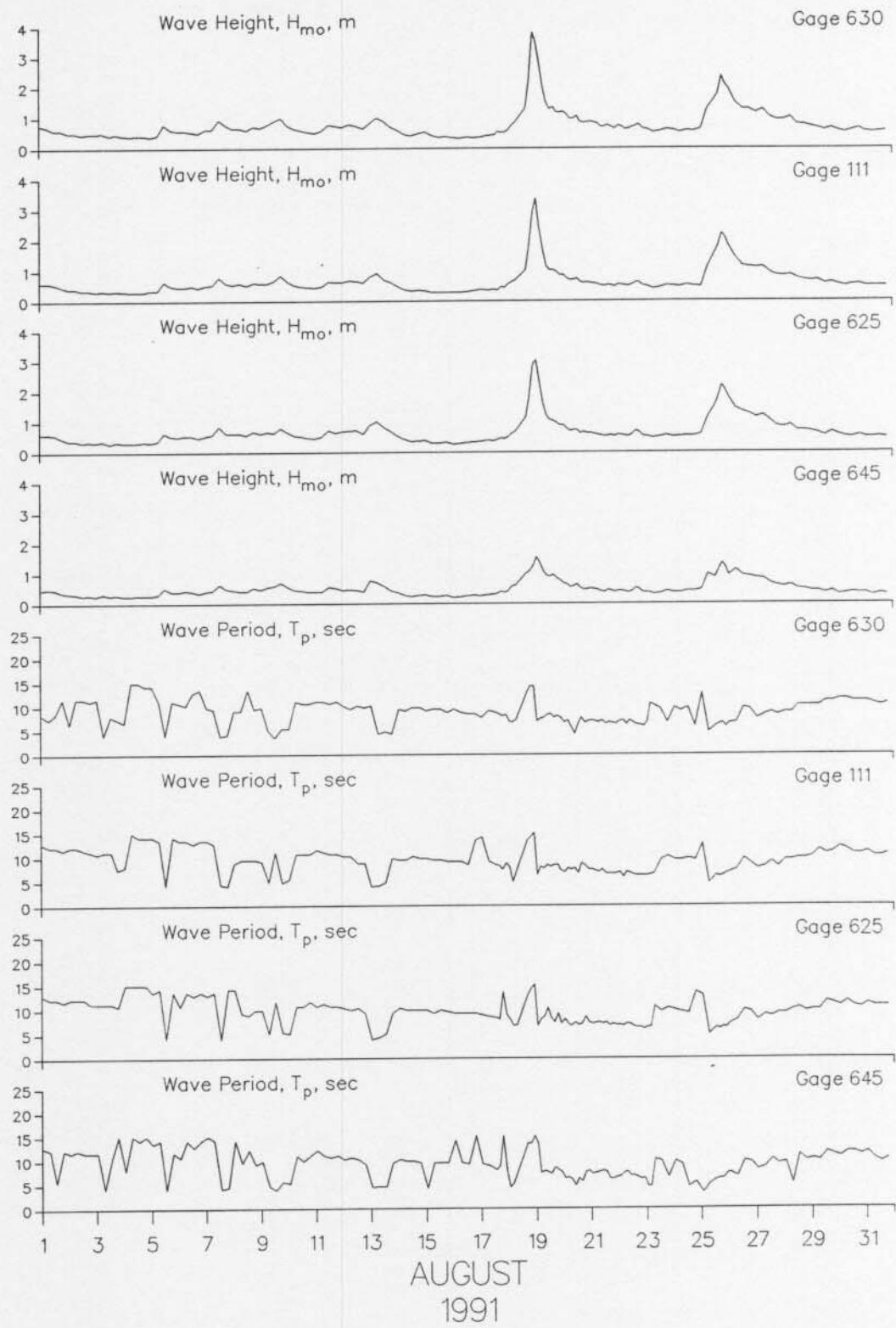
Table 3: Wave Data

Aug 1991

Day	Hour	645		625		111		630	
		Baylor at 7+80	Hmo.m T.sec	Baylor at 18+60	Hmo.m T.sec	Pressure Gage	Hmo.m T.sec	Offshsr Wvrdr	Hmo.m T.sec
17	0100	0.25	9.14	0.35	8.83	0.37	14.22	0.34	7.76
	0700	0.28	8.83	0.39	8.53	0.36	9.14	0.41	9.14
	1300	0.30	8.00	0.37	8.26	0.37	8.53	0.42	8.83
	1900	0.40	15.06	0.47	13.47	0.46	7.53	0.52	8.00
18	0100	0.43	4.27	0.50	8.00	0.55	8.00	0.59	6.92
	0700	0.61	7.31	0.68	6.74	0.67	7.31	0.84	7.31
	1300					Operator Error			
	1900	1.07	13.47	1.77	14.22	1.77	14.22	2.13	14.22
19	0100	1.54	13.47	3.02	6.56	3.37	6.40	3.47	6.92
	0700	1.08	7.76	1.62	8.53	1.66	7.76	2.01	7.76
	1300	0.90	7.11	1.06	8.26	1.01	8.00	1.29	8.53
	1900	0.84	8.00	0.98	9.14	0.96	8.53	1.16	8.00
20	0100	0.67	6.24	0.89	8.00	0.86	6.92	1.20	6.74
	0700	0.53	5.95	0.70	6.56	0.67	7.53	0.96	5.95
	1300	0.63	6.24	0.74	6.74	0.73	6.74	1.05	6.24
	1900	0.44	7.53	0.66	8.53	0.59	8.26	0.82	6.56
21	0100	0.49	7.11	0.63	7.11	0.59	7.53	0.86	7.11
	0700	0.45	7.53	0.58	7.31	0.56	6.92	0.80	6.74
	1300	0.38	7.53	0.51	7.31	0.48	6.56	0.70	6.40
	1900	0.41	6.09	0.56	6.92	0.49	6.56	0.68	6.56
22	0100	0.41	6.56	0.56	6.74	0.54	6.92	0.73	6.92
	0700	0.38	7.53	0.53	7.11	0.49	7.11	0.61	6.24
	1300	0.42	6.74	0.59	6.40	0.54	6.40	0.67	6.56
	1900	0.47	6.09	0.66	6.24	0.61	6.24	0.76	6.09
23	0100	0.37	4.57	0.52	6.24	0.48	6.24	0.60	6.74
	0700	0.31	10.24	0.47	10.67	0.39	6.74	0.51	10.24
	1300	0.33	9.85	0.49	9.48	0.43	9.48	0.52	9.48
	1900	0.42	6.40	0.55	10.24	0.49	10.24	0.60	6.74
24	0100	0.37	9.85	0.49	9.85	0.48	9.48	0.58	9.85
	0700	0.37	9.14	0.51	9.48	0.46	9.48	0.52	9.14
	1300	0.41	4.41	0.53	9.14	0.51	9.85	0.56	9.85
	1900	0.42	5.45	0.53	13.47	0.48	9.48	0.54	5.95
25	0100	0.45	3.16	0.58	12.80	0.46	12.80	0.61	12.80
	0700	0.97	4.92	1.14	4.83	1.12	4.74	1.28	4.74
	1300	0.87	5.95	1.51	6.24	1.56	6.24	1.61	5.95
	1900	1.34	6.24	2.19	6.40	2.20	6.24	2.37	6.56
26	0100	0.93	7.31	1.83	7.11	1.82	6.92	1.94	6.56
	0700	1.13	6.56	1.44	7.76	1.42	7.53	1.50	6.74
	1300	0.93	9.85	1.34	9.85	1.15	9.85	1.28	9.85
	1900	0.89	9.48	1.26	9.48	1.13	8.83	1.27	9.48
27	0100	0.85	8.00	1.13	7.76	1.10	7.76	1.14	7.53
	0700	0.82	8.53	1.20	8.83	1.12	8.00	1.25	8.26
	1300	0.66	10.24	1.04	8.53	0.92	9.14	1.01	8.83
	1900	0.60	9.14	0.86	9.14	0.84	8.00	0.92	8.26
28	0100	0.56	9.48	0.82	9.14	0.82	9.48	0.92	8.83
	0700	0.62	5.12	0.90	9.85	0.85	9.48	1.02	8.83
	1300	0.48	11.13	0.72	10.24	0.75	9.85	0.78	10.24
	1900	0.47	9.85	0.70	9.48	0.67	9.85	0.77	10.24
29	0100	0.42	10.24	0.67	9.85	0.66	10.24	0.71	10.24
	0700	0.42	9.85	0.63	9.85	0.67	11.64	0.65	10.24
	1300	0.35	11.64	0.54	11.64	0.57	10.67	0.59	11.13
	1900	0.41	11.13	0.65	11.13	0.60	11.13	0.65	11.13
30	0100	0.29	10.67	0.57	10.67	0.54	12.19	0.56	11.64
	0700	0.32	11.64	0.50	11.64	0.49	11.64	0.52	11.64
	1300	0.35	11.64	0.48	10.67	0.53	10.67	0.58	11.13
	1900	0.34	11.13	0.56	10.24	0.55	10.67	0.63	11.13
31	0100	0.35	11.64	0.49	11.13	0.48	11.13	0.54	11.13
	0700	0.25	10.24	0.49	10.67	0.49	10.24	0.52	10.67
	1300	0.32	9.48	0.50	10.67	0.48	10.24	0.54	10.24
	1900	0.29	10.24	0.47	10.67	0.48	10.67	0.55	10.67
Mean		0.48	9.34	0.66	9.78	0.63	9.51	0.74	8.94
Std dev		0.23	3.09	0.39	2.58	0.41	2.58	0.44	2.50

* Electronic problems

(Sheet 2 of 2)



PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter	
	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore (NGVD) ID #519	Depth -5.6m
1 0100-Along Cross Result									1	S
1 0700-Along Cross Result	9 9 off	S	140	.9 2 on	N	South	9 N		1	on
1 1300-Along Cross Result	12 115			10 326					1	205
1 1900-Along Cross Result									4	N
2 0100-Along Cross Result									2	off
2 0700-Along Cross Result	14 2 off	N	152	5 1 off	N	South	14 N		4	7
2 1300-Along Cross Result	14 349			5 354					1	S
2 1900-Along Cross Result									9	off
3 0100-Along Cross Result									9	76
3 0700-Along Cross Result	23 6 off	N	152	9 7 off	N	South	14 N		2	S
3 1300-Along Cross Result	24 354			11 17					1	on
3 1900-Along Cross Result									2	187
4 0100-Along Cross Result									2	S
4 0700-Along Cross Result	7 7 off	N	165	4 4 off	N	South	5 N		2	off
4 1300-Along Cross Result	10 28			6 22					1	115
4 1900-Along Cross Result									1	N
5 0100-Along Cross Result									0	
5 0700-Along Cross Result	27 4 on	S	165	24 0	S	North	10 S		1	340
5 1300-Along Cross Result	27 169			24 160					3	S
5 1900-Along Cross Result									1	on
									3	178
									9	S
									15	off
									17	101
									10	S
									5	off
									11	133
									24	S
									22	off
									33	117
									16	S
									11	off
									19	125

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
6 0100-Along Cross Result										17	S
										4	off
										17	147
6 0700-Along Cross Result	11 8 14	S on 197		22 14 26	S off 127			3 S		21 8 22	S off 139
6 1300-Along Cross Result										11 3 11	S off 145
6 1900-Along Cross Result										16 10 19	S off 128
7 0100-Along Cross Result										12 8 14	S off 126
7 0700-Along Cross Result	5 9 10	S on 223		36 9 37	S off 146			no observation		15 9 17	S off 129
7 1300-Along Cross Result										11 3 11	N on 325
7 1900-Along Cross Result										13 5 14	N on 319
8 0100-Along Cross Result										9 5 10	N off 9
8 0700-Along Cross Result	15 8 17	S on 187		15 4 15	S off 143			10 N		6 3 7	S off 133
8 1300-Along Cross Result										9 5 10	S on 189
8 1900-Along Cross Result										0 0 0	
9 0100-Along Cross Result										6 0 6	N 340
9 0700-Along Cross Result	47 7 47	N off 349		24 4 25	N off 349			no observation		2 1 2	S off 133
9 1300-Along Cross Result										3 7 8	N on 273
9 1900-Along Cross Result										10 7 12	N on 305
10 0100-Along Cross Result										9 8 12	N on 298
10 0700-Along Cross Result	14 4 14	N on 323		41 0 41	N off 340			18 N		5 6 8	N off 30
10 1300-Along Cross Result										4 2 4	S off 133
10 1900-Along Cross Result										6 3 7	N off 7

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
11 0100-Along Cross Result										2	S
										5	off
										5	92
11 0700-Along Cross Result	5 6 8	N on 288		177	13 0 13	S S 160		3 S		4 6 7	S off 104
11 1300-Along Cross Result										20 18 27	S off 118
11 1900-Along Cross Result										23 3 23	S off 153
12 0100-Along Cross Result										29 8 30	S off 145
12 0700-Along Cross Result	38 2 38	S on 163		177	11 3 12	S on 174		16 N		14 1 14	S off 156
12 1300-Along Cross Result										25 14 29	S off 131
12 1900-Along Cross Result										6 2 6	S on 178
13 0100-Along Cross Result										16 7 17	S off 136
13 0700-Along Cross Result	12 7 14	S on 191		177	11 3 12	N on 326		9 N		16 5 17	S off 143
13 1300-Along Cross Result										7 2 7	S off 144
13 1900-Along Cross Result										10 7 12	S on 195
14 0100-Along Cross Result										2 2 3	S on 205
14 0700-Along Cross Result	0 5 5			165	11 4 12	N off 2		14 N		4 2 4	N off 7
14 1300-Along Cross Result										1 8 8	S off 77
14 1900-Along Cross Result										11 3 11	N off 355
15 0100-Along Cross Result										4 0 4	N off 340
15 0700-Along Cross Result	23 9 25	N off 2		180	15 6 16	N off 2		6 N		16 0 16	N off 340
15 1300-Along Cross Result										3 9 9	N off 52
15 1900-Along Cross Result										14 8 16	N off 10

KEY = All speeds in cm/sec
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 on = onshore off = offshore

Table 4: Current Data (Continued)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir
16 0100-Along Cross Result										13	N
										1	off
										13	344
16 0700-Along Cross Result	23	N		7	N			10	N	14	N
	0			2	off					4	off
	23	340		7	354					15	356
16 1300-Along Cross Result										14	N
										5	off
										15	360
16 1900-Along Cross Result										8	N
										3	off
										9	1
17 0100-Along Cross Result										9	N
										7	off
										11	18
17 0700-Along Cross Result	44	N		27	N			10	N	5	N
	0			0						4	off
	44	340		27	340					6	19
17 1300-Along Cross Result										6	N
										4	on
										7	306
17 1900-Along Cross Result										5	N
										2	off
										5	2
18 0100-Along Cross Result										4	N
										5	off
										6	31
18 0700-Along Cross Result	61	N		55	N			28	N	7	N
	0			0						7	off
	61	340		55	340					10	25
18 1300-Along Cross Result											
18 1900-Along Cross Result										49	N
										2	on
										49	338
19 0100-Along Cross Result										63	S
										18	off
										66	144
19 0700-Along Cross Result	21	S		68	S			50	S	25	S
	13	off		24	off					10	off
	25	129		72	141					27	138
19 1300-Along Cross Result										13	S
										11	off
										17	120
19 1900-Along Cross Result										13	S
										10	off
										16	122
20 0100-Along Cross Result										6	N
										2	on
										6	322
20 0700-Along Cross Result	41	N		38	N					3	N
	0			0						1	off
	41	340		38	340					3	358
20 1300-Along Cross Result										23	N
										7	on
										24	323
20 1900-Along Cross Result										17	N
										7	on
										18	318

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Table 4: Current Data (Continued)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
21 0100-Along Cross Result										10 N
										3 on
										10 323
21 0700-Along Cross Result	0 4 off	201	0 6 off			South	9 N			1 N
	4 70		6 70							3 off
										3 52
21 1300-Along Cross Result										4 N
										14 off
										15 54
21 1900-Along Cross Result										2 S
										5 off
										5 92
22 0100-Along Cross Result										6 N
										5 off
										8 20
22 0700-Along Cross Result	20 0 S		14 2 S on			South	15 N			14 S
	20 160		169							11 off
										18 122
22 1300-Along Cross Result										10 S
										19 off
										21 98
22 1900-Along Cross Result										18 S
										9 off
										20 133
23 0100-Along Cross Result										12 S
										11 off
										16 117
23 0700-Along Cross Result	22 0 S		0 5 off			no observation				10 S
	22 160		5 70							8 off
										13 121
23 1300-Along Cross Result										6 S
										10 off
										12 101
23 1900-Along Cross Result										1 S
										3 off
										3 88
24 0100-Along Cross Result										5 N
										3 off
										6 11
24 0700-Along Cross Result	10 3 on		10 3 on			South	9 N			2 N
	10 177		177							6 off
										6 52
24 1300-Along Cross Result										0
										0
										0
24 1900-Along Cross Result										4 N
										2 off
										4 7
25 0100-Along Cross Result										10 S
										5 off
										11 133
25 0700-Along Cross Result	47 7 on		30 5 on			North	38 S			17 S
	47 169		177							5 off
										18 144
25 1300-Along Cross Result										52 S
										20 off
										56 139
25 1900-Along Cross Result										47 S
										19 off
										51 138

KEY = All speeds in cm/sec
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on = onshore off = offshore

Table 4: Current Data (Continued)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	12m offshore (surface)	Location	Speed	Dir	Speed	Dir	
26 0100-Along Cross Result								46	S	
								15	off	
								48	142	
26 0700-Along Cross Result	51 0	S 160	177	76 0	S 160	49	S	31	S	
								14	off	
								34	136	
26 1300-Along Cross Result								45	S	
								19	off	
								49	137	
26 1900-Along Cross Result								21	S	
								1	off	
								21	157	
27 0100-Along Cross Result								23	S	
								10	off	
								10	off	
								25	137	
27 0700-Along Cross Result	15 2 on	S 169	177	34 0	N 340	9	N	10	S	
								4	off	
								11	138	
27 1300-Along Cross Result										
27 1900-Along Cross Result										
28 0100-Along Cross Result										
28 0700-Along Cross Result	55 0	N 340	189	30 0	N 340	24	N			
								9	N	
								0		
								9	340	
28 1300-Along Cross Result								13	N	
28 1900-Along Cross Result								5	on	
								14	319	
29 0100-Along Cross Result								8	N	
								3	on	
								9	319	
29 0700-Along Cross Result	11 5	N off	177	0 4		3	S	12	N	
								6	on	
								13	313	
29 1300-Along Cross Result	12	2		4	off			1	S	
								2	off	
								2	97	
29 1900-Along Cross Result								6	N	
								1	off	
								6	349	
30 0100-Along Cross Result								1	N	
								3	on	
								3	268	
30 0700-Along Cross Result	0 5		165	0 0		5	N	6	N	
								2	on	
								6	322	
30 1300-Along Cross Result	5 70			0 0				2	N	
								3	off	
								4	36	
30 1900-Along Cross Result								15	N	
								7	on	
								17	315	

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 N = Northward, Shore parallel
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 on = onshore off = offshore

Table 4: Current Data (Concluded)
Aug 1991

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter	
	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline	Speed	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Dir
Speed	Dir	(m)	Dir	Speed	Dir	Speed	Dir	Speed	Dir	
31 0100-Along Cross Result								2	N	
								1	on	
								2	313	
31 0700-Along Cross Result	23	N		19	N		15	N	10	N
	12	off	165	7	off	South			7	on
	26	7		20	359				12	305
31 1300-Along Cross Result									8	N
									3	on
									9	319
31 1900-Along Cross Result									20	N
									2	off
									20	346

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 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Aug 1991

Day	Time	Wave Approach			Radar Wave Angle deg from True N	Width of Surf Zone.m	Water Characteristics at Pier End		
		Primary	Secondary	deg from True N			Temp., C	Density g/cc	Secchi Vis., m
1	0847	110	40			29	25.6	1.0202	4.3
2	0822	110				8	24.1	1.0202	3.0
3	1010	110				8	23.3	1.0214	1.8
4	0811	110				9	24.4	1.0210	3.0
5	0825	100				82	26.1	1.0210	4.9
6	0801	95	35		90	111	26.7	1.0206	2.7
7	0854	50	85		80	143	26.7	1.0202	2.4
8	0830	100	70			88	26.7	1.0200	4.0
9	0858	90	130		80	14	26.1	1.0210	1.2
10	1330	100	25			6	23.3	1.0218	
11	0719	90	10			116	25.0	1.0206	3.7
12	0821	100				5	25.6	1.0200	3.4
13	0755	100			95	15	25.6	1.0200	2.7
14	0742	90	120			3	26.1	1.0202	2.7
15	0641	120				8	24.4	1.0208	2.7
16	0830	95				3	25.3	1.0206	5.5
17	0800	105				3	25.6	1.0200	3.4
18	0915	100				152	24.4	1.0200	3.4
19	0916	50				183	24.4	1.0208	1.2
20	0830	115			80	12	23.3	1.0210	1.8
21	0740	110				15	23.3	1.0214	1.2
22	0830	110				14	23.3	1.0214	
23	0650	100				6	25.6	1.0194	3.4
24	0830	115				14	25.6	1.0210	4.0
25	0614	50			90	2	26.1	1.0210	3.0
26	0742	60	30		60	183	25.6	1.0202	0.9
27	0800	80			80	27	26.1	1.0193	1.8
28	0700	90				26	26.1	1.0201	3.0
29	0645	100				17	24.4	1.0204	1.2
30	0944	100				10	25.6	1.0212	1.5
31	0700	100				5	23.9	1.0214	1.2

PART VI: WATER LEVELS

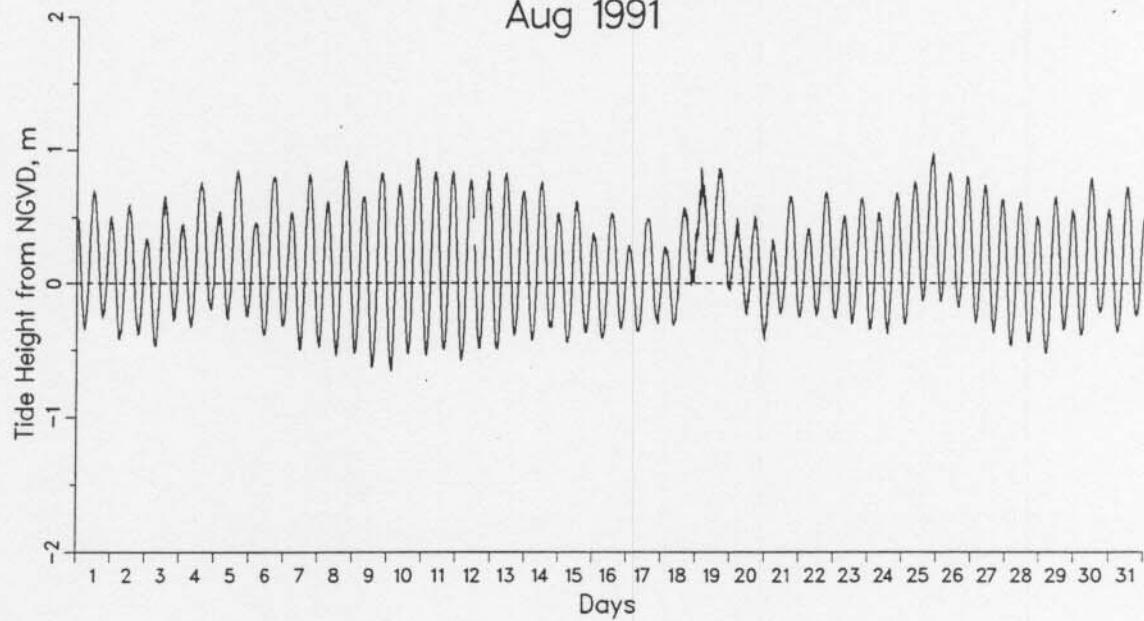
Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Aug 1991



Monthly Water Levels, m NGVD

Extreme Low = -0.66 on day 10 at 124 EST
Extreme High = 0.98 on day 25 at 1948 EST
Monthly Mean = 0.15
Mean Low = -0.35
Mean High = 0.71
Mean Range = 1.06

Table 6: Water Levels.m NGVD

		Aug 1991				
Day	Time	Mid-Cycle	Low	High	Mean	Range
1	700	-0.34	0.70	0.17	1.04	
1	1925	-0.26	0.54	0.15	0.80	
2	750	-0.42	0.60	0.07	1.01	
2	2015	-0.38	0.45	0.01	0.83	
3	840	-0.47	0.66	0.05	1.13	
3	2106	-0.28	0.54	0.12	0.82	
4	931	-0.33	0.77	0.18	1.09	
4	2156	-0.20	0.69	0.21	0.89	
5	1021	-0.27	0.85	0.24	1.12	
5	2246	-0.25	0.77	0.18	1.02	
6	1112	-0.39	0.80	0.16	1.19	
6	2337	-0.32	0.78	0.17	1.10	
7	1202	-0.50	0.82	0.11	1.33	
8	27	-0.48	0.78	0.11	1.26	
8	1252	-0.55	0.92	0.14	1.47	
9	118	-0.52	0.88	0.13	1.40	
9	1343	-0.62	0.83	0.09	1.46	
10	208	-0.66	0.83	0.08	1.48	
10	1433	-0.53	0.94	0.18	1.47	
11	258	-0.54	0.90	0.19	1.44	
11	1524	-0.50	0.84	0.18	1.34	
12	349	-0.58	0.81	0.11	1.39	
12	1614					
13	439	-0.49	0.83	0.15	1.33	
13	1704	-0.39	0.80	0.20	1.19	
14	530	-0.43	0.77	0.15	1.19	
14	1755	-0.33	0.73	0.14	1.06	
15	620	-0.44	0.62	0.06	1.07	
15	1845	-0.37	0.59	0.06	0.95	
16	710	-0.41	0.53	0.02	0.94	
16	1935	-0.34	0.52	0.05	0.86	
17	801	-0.36	0.49	0.01	0.85	
17	2026	-0.30	0.49	0.06	0.79	
18	851	-0.31	0.57	0.06	0.89	
18	2116	-0.02	0.87	0.35	0.89	
19	941	0.16	0.87	0.48	0.71	
19	2207	-0.05	0.86	0.32	0.92	
20	1032	-0.24	0.51	0.12	0.75	
20	2257	-0.42	0.49	0.00	0.91	
21	1122	-0.23	0.66	0.13	0.88	
21	2347	-0.25	0.66	0.15	0.91	
22	1213	-0.25	0.69	0.16	0.93	
23	38	-0.26	0.68	0.17	0.94	
23	1303	-0.30	0.65	0.16	0.95	
24	128	-0.34	0.64	0.13	0.98	
24	1353	-0.37	0.68	0.14	1.05	
25	219	-0.30	0.77	0.22	1.07	
25	1444	-0.13	0.98	0.39	1.11	
26	309	-0.14	0.94	0.39	1.08	
26	1534	-0.18	0.81	0.32	0.99	
27	359	-0.30	0.74	0.24	1.04	
27	1625	-0.37	0.64	0.16	1.01	
28	450	-0.46	0.62	0.08	1.08	
28	1715	-0.44	0.51	0.05	0.95	
29	540	-0.52	0.66	0.04	1.18	
29	1805	-0.35	0.55	0.12	0.90	
30	631	-0.38	0.80	0.17	1.18	
30	1856	-0.22	0.63	0.19	0.84	
31	721	-0.37	0.73	0.15	1.09	
31	1946	-0.25	0.58	0.12	0.83	

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in July and the three surveys in August on profile line 188, located 517 m south of the pier. The first survey, on 13 August, shows a 20 m shoreward movement of the nearshore bar (180 - 280 m). Despite the close passage of Hurricane Bob on 18 August the survey following the storm (19 August) shows surprisingly little change. These included a pronounced steepening of the nearshore bar (at 200 - 240 m) with a corresponding 0.5 m increase in the bars height. This was accompanied by a small amount of accretion on the berm (at 100 m). By the end of the month the profile had returned to its pre-hurricane configuration.

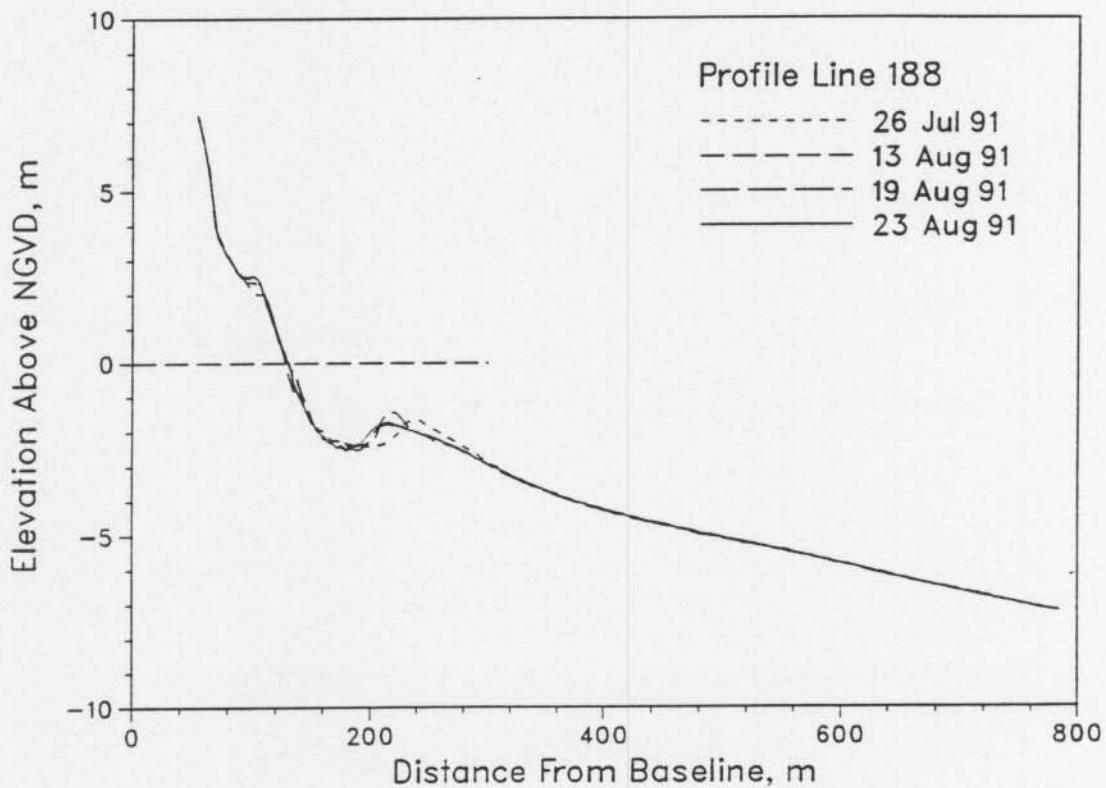


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1991. The small changes to the envelope (at 100 and 220 m) were caused by Hurricane Bob.

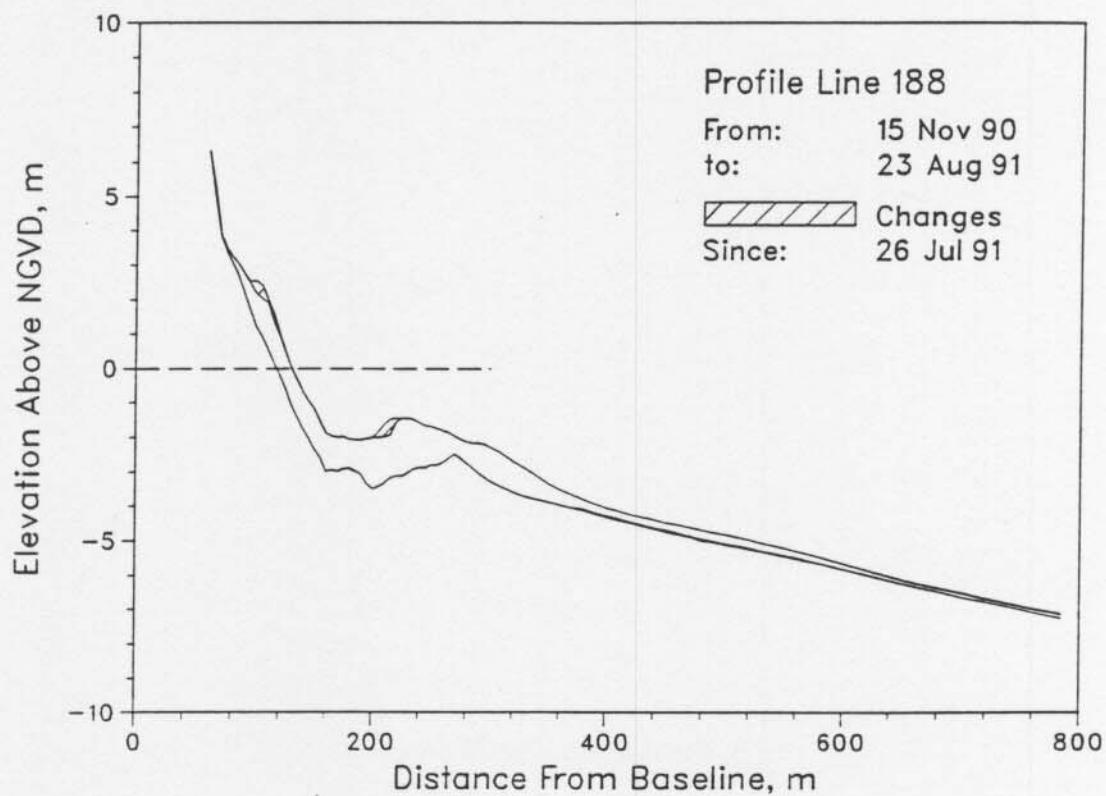


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 23 August. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

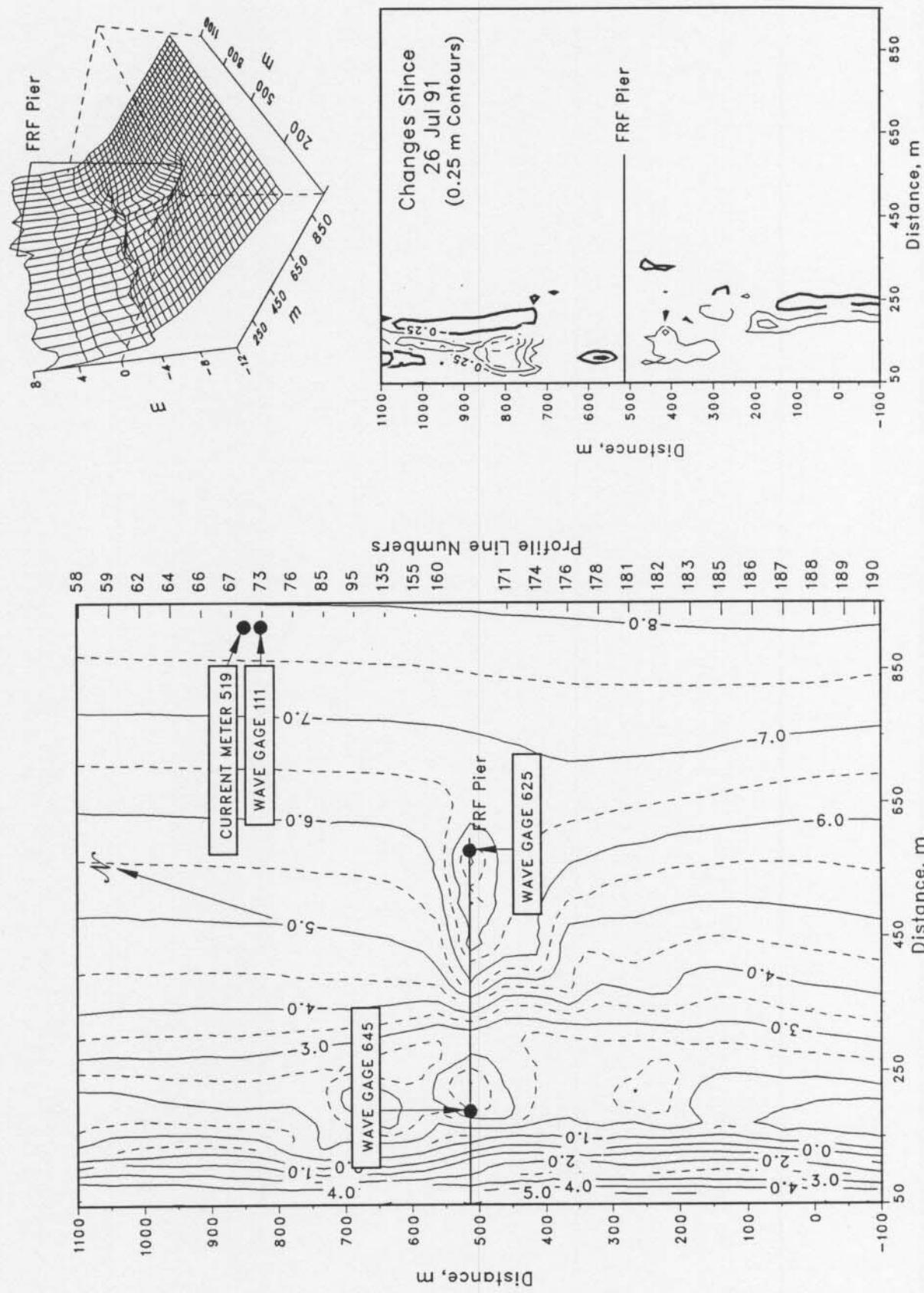


Figure 7, FRF bathymetry 23 Aug 91 depths relative to NGVD

PART VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the significant wave height at the seaward end of the pier (i.e. as measured near the end of the pier) exceeded 2 m and four contiguous 34 minute wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
18 Aug (2008)	19 Aug (0434)
25 Aug (1708)	25 Aug (2200)

B. Storm Synopsis.

18-19 August (Hurricane Bob) - Bob reached tropical storm intensity on 16 August while located close to Bermuda. Intensifying while moving to the northwest, Bob was upgraded to a Hurricane on 17 August. Centered off Daytona Beach, Florida the storm continued to intensify as it rapidly moved up the east coast developing into a Catagory 3 hurricane (winds of 50 - 58 m/s (111 to 130 mph) on the Saffir/Simpson hurricane scale) as the eye passed 25 - 30 (40 - 48 km) miles east of Cape Hatteras, NC early on 19 August. Continuing up the coast the storm finally made landfall on the Rhode Island coast late on 19 August. The maximum H_{mo} (at gage 630) of 4.83 m ($T_p = 15.06$ sec) was recorded at 2342 EST on 18 August while maximum onshore winds (from northeast) approaching 15 m/s occurred several hours earlier at 1934 EST. Peak winds (from northwest) actually exceeded 23 m/s near midnight on 18 August, this coincided with the minimum atmospheric pressure of 994.0 mb. Total precipitation was 43 mm. Figure 8 displays data during the storm from selected gages.

25 August - A Canadian high pressure system briefly produced storm waves at the FRF on 25 August. Maximum winds (from northeast) exceeding 13 m/s peaked at 1708 EST on 25 August with the maximum H_{mo} (at gage 625) of 2.19 m ($T_p = 6.40$ sec) occurring several minutes later at 1742 EST.

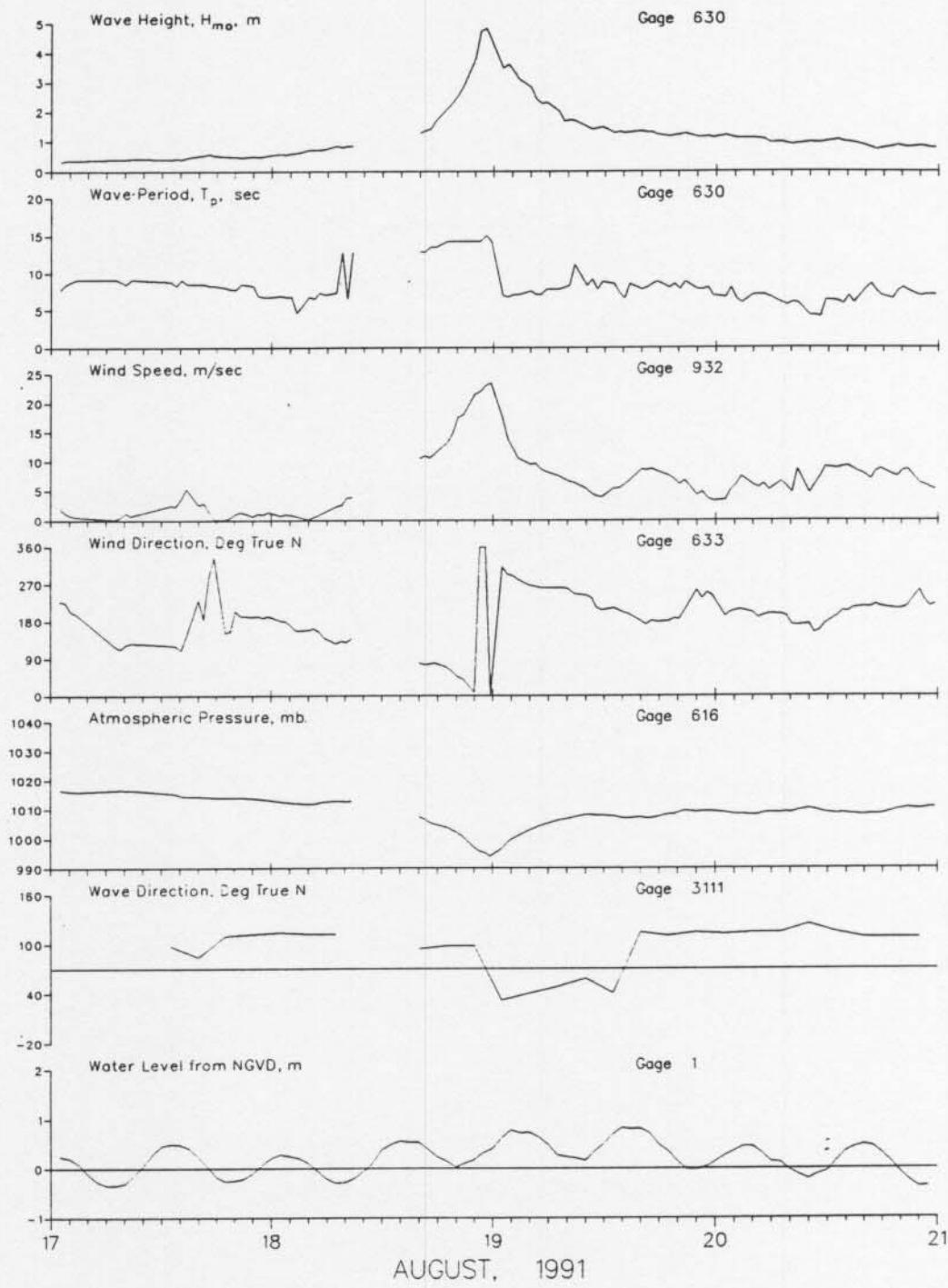


Figure 8. Data for Hurricane Bob

Distribution List

Government Agencies:

OCE	U.S. Geological Survey
BERH	U.S. National Park Service
NAO	U.S. Naval Academy
NASA/Wallops Flight Center	U.S. Naval Civil Eng. Lab
NOAA (NOS, NWS)	U.S. Naval Fac. Eng. Com.
SAD	U.S. Naval Oceanographic Off.
SAW	U.S. Naval Research Lab

Colleges/Universities:

California Inst. of Tech.	Stockton State College
East Carolina University	University of Akron
Florida Inst. of Tech.	University of Delaware
Harvard University	University of Florida
Naval Post Graduate School	University of Maryland
NC State University	University of Miami
Old Dominion University	University of North Carolina
Oregon State University	University of N. Colorado
Prince George's College	University of Rhode Island
Rutgers University	University of Virginia
Scripps Inst. of Oceanography	Va. Inst. of Marine Science
Southern Illinois University	

Others:

City of Va. Beach, VA	MEC Systems Corporation
Coastal Barge Corporation	Moffatt & Nichol, Eng.
Coastal and Est. Res., Inc.	Offshore Coastal Technologies
Coastal Science & Eng., Inc.	Mr. Rowland
Dr. Galvin	Mr. Savage
GEOMET Tech., Inc.	Sea Port Supply Corp.
Greenhorne & O'Mara, Inc.	Shell Development
Dr. Hylton	Sherwood Industries
Mary Marr, Inc.	Mr. & Mrs. Valpey
Mr. Mason	WCTI-TV
Masonite Corporation	SEASUN Power Systems

Foreign:

W. F. Baird & Asso. Coastal Engineers, Ltd (Canada)
Queen's University, Ontario (Canada)
Ministry of Construction, Coastal Division (Japan)
Norwegian Hydrodynamic Laboratories (Norway)
University of New South Wales (Australia)
University of Sydney (Australia)